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TITLE: AGB evolution and possible dependences of PN oxygen and argon abundances on progenitor mass and metallicity
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ABSTRACT:
Measured argon abundances in PNe reflect the ISM abundance at the time of their birth as surface argon is invariant during AGB evolution. Differently from argon, the surface oxygen has been found to be modified in the AGB phase, particularly in stars with initial mass ≥ 3Msun where Hot Bottom Burning (HBB) may result in an oxygen depletion (of up to ~ 0.2 dex) which results in measured PN oxygen abundances lower than those of their birth values. On the other hand, for PNe evolving from stars with initial masses of 1 − 2Msun and Z< 0.008, Third Dredge Up (TDU) effects may result in an oxygen enrichment of up to ~ 0.3 dex. Delgado-Inglada et al. (2015) claimed evidence to this effect, with oxygen found to be enriched by up to ~ 0.3 dex for intermediate metallicities of 12+(O/H) = 8.2−8.7 for PNe with carbon-rich (circumstellar) dust (CRD), while it was invariant in PNe with oxygen-rich (circumstellar) dust (ORD). Using a larger sample of 101 MW PNe with abundance measurements and dust , we compared their O/Ar abundances with the chemical evolution tracks by Kobayashi et al. (2020a). We find that both MW CRD and ORD PNe (as well as PNe with featureless dust) follow the MW stellar evolution tracks with no oxygen enrichment or depletion relative to argon abundances. Similarly we find no conclusive evidence of AGB evolution effects for the M31 disc PNe studied in Arnaboldi et al. (2022). For extragalactic PNe in M31, the oxygen abundance measurements for M31 PNe reflect their bir